American Association of State Highway and Transportation Officials

AASHTO

Guide Specifications for Bridges Carrying Light Rail Transit Loads

FIRST EDITION 2018

TABLE OF CONTENTS

Section 1
General

1.1—SCOPE

These guide specifications (LRT Guide Specifications) are a supplement to the *AASHTO LRFD Bridge Design Specifications* (LRFD Bridge Design) that address the design of bridges subjected to light rail transit (LRT) loadings, or both LRT and conventional highway traffic loadings. The LRT Guide Specifications state only the minimum requirements necessary to provide for public safety and are not intended to supplant proper training or the exercise of judgment by the Designer. The Owner or the Designer may require levels of sophistication for design and quality of materials and construction to be higher than the minimum requirements.

Except as superseded herein, LRFD Bridge Design and the *AASHTO LRFD Bridge Construction Specifications* shall govern the design and construction of bridges subjected to LRT loadings, or LRT and conventional highway loadings. Seismic design shall be in accordance with either the provisions in the appropriate sections of LRFD Bridge Design or the provisions in the *AASHTO Guide Specifications for LRFD Seismic Bridge Design*.

This document is largely dedicated to LRT load cases and load effects, and analysis of bridges subjected to LRT loadings. The following subjects are not covered: mechanical and electrical components of light rail trains, track materials and configurations, public utilities, transit signal work, and the maintenance of transit systems.

The commentary is not intended to provide a detailed summary of the studies and research data reviewed in formulating the provisions of the LRT Guide Specifications. However, technical discussions are provided as required.

C1.1

Light rail transit is defined as an electric railway system characterized by its ability to operate single or multiple cars along exclusive rights-of-way at ground level, on aerial structures, in subways, or on streets; able to board and discharge passengers at station platforms or at street, track, or car-floor level; and normally powered by overhead electrical wires.

Article 1.1 provides the scope of the LRT Guide Specifications, their applicability, and their limitations. The commentary directs attention to other documents when necessary, which provide guidance for carrying out the requirements and intent of these LRT Guide Specifications. However, the commentary and references herein are not part of the LRT Guide Specifications.

The design provisions of these LRT Guide Specifications employ the load and resistance factor design (LRFD) methodology. The load factors relevant to light rail transit loading have been developed from the theory of reliability based on current statistical knowledge of loads and structural performance.

1.2—NOTATION

A = cross-sectional area of rail (in.^{2}) (C3.3.4)
a_h = centrifugal acceleration (ft/sec^2) (C3.2.5)
C = centrifugal force multiplier for a curved bridge superstructure (3.2.5)
c_l = parameter for skewed supports (Table 4.4.4-1)
d = depth of member (ft) (4.4.3)
d_e = horizontal distance from the centerline of the exterior web of exterior beam at the deck level to the interior edge of curb or traffic barrier (ft) (4.4.3)
E = elastic modulus of rail (psi) (C3.3.4)
e = correction factor for distribution (Table 4.4.3-1)
f'_c = specified concrete strength in compression (ksi) (3.1.1)
G_{max} = rail break gap (in.) (C3.3.4)
g = gravitational acceleration (ft/sec^2) (3.2.5); live load distribution factor representing the number of lanes (Table 4.4.3-1)
H = height of the retarding surface above the ground surface (ft) (3.2.7.2)
K_g = longitudinal stiffness parameter (in.^{4}) (4.4.3)
L = bridge span length (ft) (4.4.3)
N_b = number of beams, stringers, or girders (4.4.3)
N_c = number of cells in a concrete box girder (4.4.3)
N_{clip} = number of rail clips on fastener (C3.3.4)
n = number of loaded tracks (3.2.5)

$P_{longitudinal}$ = longitudinal rail force associated with rail–structure interaction (lb) (C3.3.4)
P_{TL} = individual clip toe load (lb per fastener) (C3.3.4)
R = radius of a curvilinear track (ft) (3.2.5)
S = spacing of fastener (in.); girder spacing (ft) (C3.3.4) (4.4.3)
t_s = depth of concrete slab (in.) (4.4.3)
v = moving speed of train (ft/sec) (3.2.5)
W_e = half the web spacing plus the total overhang (ft) (4.4.3)
a = coefficient of thermal expansion of rail (per degrees Fahrenheit) (C3.3.4)
β = reliability index (2.1)
γ_{EQ} = load factor for earthquake (2.3)
γ_{SE} = load factor for settlement (2.3)
γ_{TG} = load factor for temperature gradient (2.3)
γ_p = load factor for permanent loading (2.3)
ΔT = temperature variation of rail (°F) (C3.3.4)
θ = skew angle (°) (4.4.4)
μ = coefficient of friction between rail and rail clip (C3.3.4)

1.3—DEFINITIONS

Definitions and terms related to the design of bridges shall be as stipulated in LRFD Bridge Design, unless otherwise specified.